

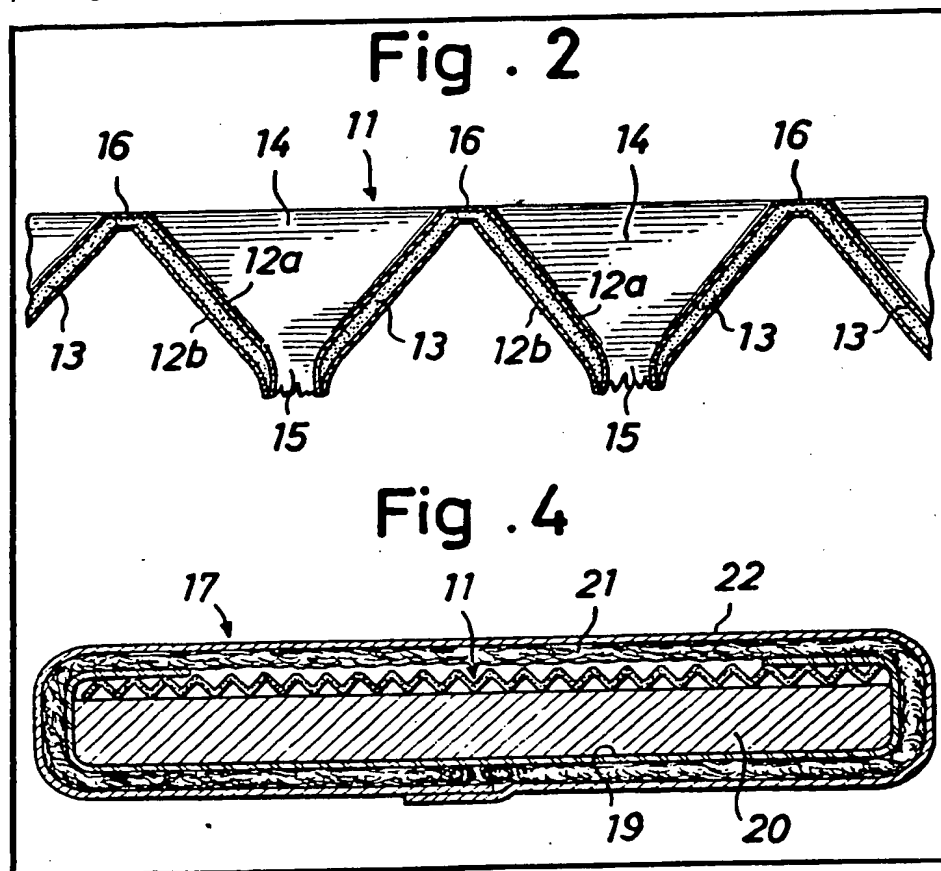
(12) UK Patent Application (19) GB (11) 2 014 046 A

- (21) Application No 7904026  
 (22) Date of filing  
 6 Feb 1979  
 (23) Claims filed  
 6 Feb 1979  
 (30) Priority data  
 (31) 53/012582  
 (32) 7 Feb 1978  
 (33) Japan (JP)  
 (43) Application published  
 22 Aug 1979  
 (51) INT CL<sup>2</sup> A61F 13/18 // B32B 1/00 3/28 5/16 5/26  
 (52) Domestic classification  
 A5R PL  
 B5N 0100 0328 0516 0526  
 (56) Documents cited  
 None  
 (58) Field of search  
 A5R  
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(54) Body exudates absorption article

cessive exudate flow occurs.

(57) A body exudates absorption article comprising powdery polymer B contained in an absorbing sheet 11; the powdery polymer being substantially aqueous insoluble in application at ambient temperatures and being capable of absorbing body exudates such as menstrual discharge, urine or the like in amounts of more than ten times its own weight. The polymer 13 is held between two permeable sheets 12a and b. The absorbing sheet 11 has a construction wherein the whole surface thereof is embossed to provide a number of dents 14 and a body exudates guide hole 15 is provided in each dent. A further absorbing layer 20 underlies the sheet 11 to absorb excess fluid passing through holes 15 if an ex-



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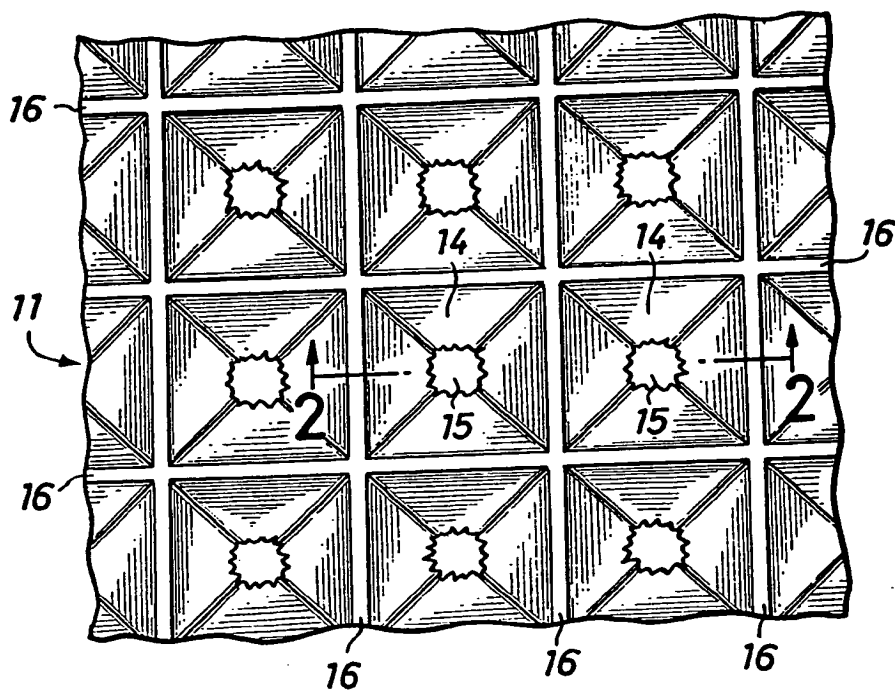
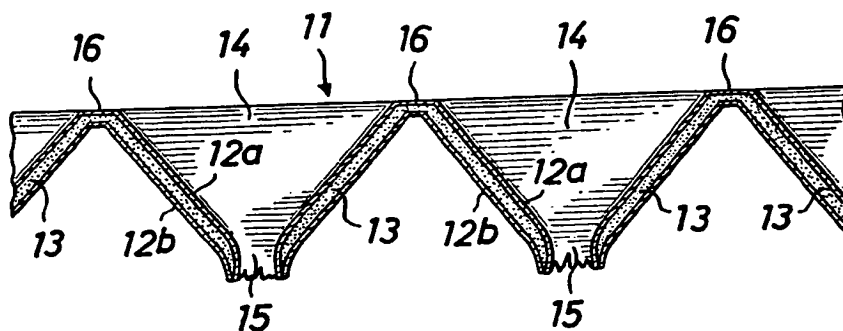
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Fig. 1

Fig. 2



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Fig . 3

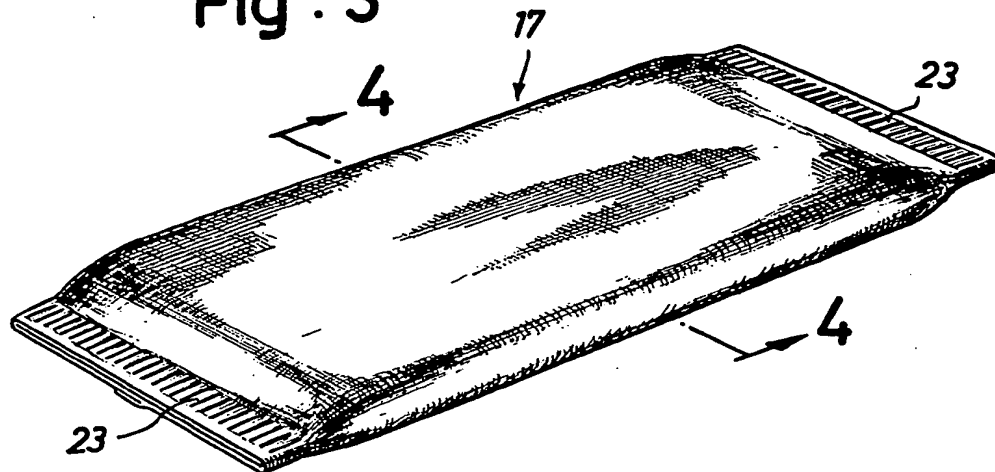


Fig . 4

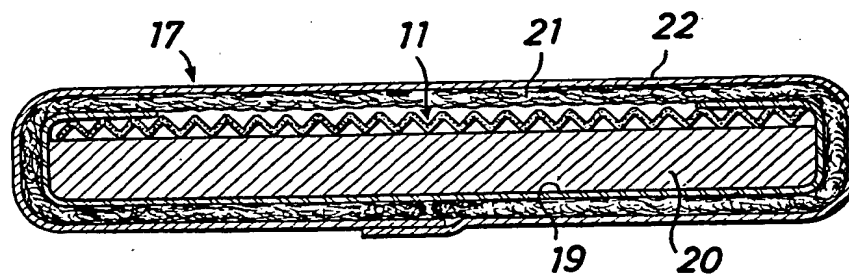
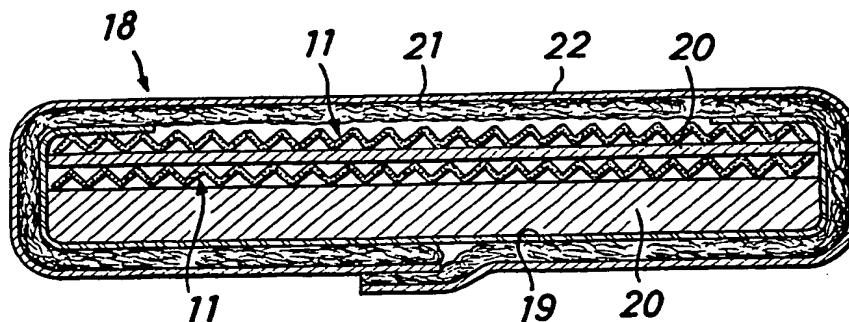


Fig . 5



## SPECIFICATION

### Body exudates absorption article

- 5 The present invention relates generally to body exudates absorption articles and, more particularly, to pads such as sanitary napkins, diapers of the like which are to absorb body exudates, such as menstrual discharge, urine  
10 or the like.

- Conventional articles of this type commercially available comprise a body exudates impermeable waterproofing backing sheet and a body exudates absorption material which is  
15 disposed on the backing sheet to overlap, the whole of such sheet and material being covered by a body exudates permeable facing sheet. As a body exudates absorption layer, a crepe tissue paper, or a crushed pulp or a  
20 layer consisting of such paper and such pulp piled to a proper thickness are used solely or in combination with an absorbent polymer.

- Since the absorbent polymer is of excellent absorption and holding ability as compared  
25 with the crepe tissue paper and the crushed pulp, it is advisable to employ such absorbent polymer as the absorption element in the body exudates absorption article. The absorbent polymer, however, is of relatively low  
30 water absorbing speed, particularly in the case where the gelation of the polymer advances to a certain degree after swelling on absorption of body exudates. Accordingly, where such  
35 polymer is disposed on the upper portion of the other absorbent material in the form of a layer or of a film, body exudates discharged from the body of the user will not be absorbed by the absorbent polymer at one time  
40 and the overflowing body exudates not having been absorbed will be caused to ooze through the sides of the body exudates absorption article or to flow inversely toward the upper surface to ooze therethrough, from which it  
45 follows that the body exudates can not effectively be conveyed to the absorbent material disposed beneath the absorbent polymer. Where the absorbent polymer is disposed in the middle layer or in the lower layer of other  
50 absorbent materials, there will be the risk of a substantial large amount of body exudates discharged being absorbed by such other absorbent materials disposed in an upper position over the absorbent polymer before reaching the absorbent polymer, without effective  
55 utilization of the absorbent polymer. Since said other absorbent materials consist solely of a crepe tissue paper or of a crushed pulp or of a combination of both the tissue paper and the crushed pulp, any one of which is of  
60 relatively low absorption and holding ability, there will also be the risk of the body exudates absorbed by these materials being caused to ooze through the sides of the body exudates absorption articles or caused to flow  
65 inversely to ooze through the upper surface,

due to pressure that may be applied during actual use. These will apparently give offence to the user.

- Meanwhile, there is known a body exudates  
70 absorption article in which an absorbent polymer film (hydrogel film) having a large number of slits is employed as an absorbent material, this article having been disclosed through the Japanese Patent Publication No.  
75 27656/1978. With a view to employing effectively the high absorption and holding ability of such absorbent polymer constituting the film, the inventor of the present invention has also tried to manufacture a sanitary napkin  
80 wherein the film of the type disclosed is disposed on the upper portion of the absorbent layer which will be a surface to be initially in contact with the largest volume of menstrual exudates. The resultant sanitary  
85 napkin, however, has been found to be disadvantageous in that although a facing sheet is arranged to be positioned on the upper surface of the film in question, this cannot provide softness and comfort for the user, due to  
90 inferiority of such film in its flexibility and elastically as compared with other absorbent materials such as a crepe tissue paper and a crushed pulp. The resultant sanitary napkin has also been found to be disadvantageous in  
95 that it may easily be out of position or be torn due to the movements in the crotch of the user, which results in inviting the risk of the menstrual exudates absorbed by the other absorbent materials beneath the film in question being caused to flow inversely to ooze  
100 through the upper surface of the napkin. As will be appreciated from these facts, the aforementioned film will not be a suitable element to be employed as the upper layer of the  
105 absorbent material. Accordingly, it could be said that the aforementioned film will be suitable only in case where the film is used as an intermediate layer in a position with some distance from the upper layer of the absorbent material. In such a case where the film is used  
110 as the intermediate layer, however, it will be seen that, as has already been discussed, relatively large volumes of the body exudates will be absorbed by the other absorbent materials disposed on the upper layer of the aforementioned film where the superior nature of  
115 absorbent polymer constituting the aforementioned film can not effectively be utilized; the body exudates absorbed by such other absorbent materials in this way will be caused to flow inversely to ooze through the upper surface of the body exudates absorption article, due to the pressure applied during actual use.

- In view of the foregoing, the inventor of the  
125 present invention considered that, in order to use effectively the excellent character of the absorbent polymer, such polymer should preferably be disposed on the upper portion of the body exudates absorbent layer which will be a  
130 member to absorb a large volume of the initial

discharge of the body exudates and which will be means to cause the body exudates absorbed to flow inversely against the facing sheet to be applied to the body of the user, and that it will be necessary to overcome such defects as were explained above with respect to the absorbent polymer film having slits. The present invention is the result of the inventor's detailed researches in these respects.

An object of the present invention is to provide a body exudates absorbing article with a unique construction wherein arrangement is made that from the time when initial discharge of the body exudates is made against the absorbing article for absorption thereby, the body exudates are suitably absorbed and held by the upper portion of the absorbent layer and the body exudates once absorbed by the lower portion of such absorbent layer are effectively prevented from flowing and oozing upward.

In order to achieve such object, the present invention employs powdery polymer and such powdery polymer is sandwiched between at least two sheets of thin water permeable sheets; the entire surface of these sheets is embossed to form a number of dent portions each having body exudates guide holes therein to constitute a unique absorbent sheet. At least one of such unique absorbent sheets is disposed on the upper portion of the absorbent layer.

It will be appreciated that, according to the body exudates absorbing article of the present invention, since the absorbent sheet containing the powdery polymer is of unique construction as explained above, such sheet is of suitable flexibility, elasticity and intensity and is without the drawbacks as will be seen in the aforementioned absorbent polymer film having slits. It will further be appreciated that since the absorbent sheet is disposed on the upper portion of the body exudates absorbing layer, the powdery polymer contained in such absorbent sheet will be in sufficient contact with the body exudates discharged and thus the body exudates will effectively be absorbed thereby; the remaining body exudates not having been absorbed at one time will be transferred via the body exudates guide holes to other absorbent layers disposed under such guide holes; inverse flowing of the body exudates absorbed by such other layer (i.e. lower layer disposed under the guide holes) to ooze through the surface sheet will, to say nothing of the inverse flowing of the body exudates already absorbed by the powdery polymer contained in the absorbent sheet, also be reduced to the minimum extent even under frequent pressures applied to the article during the actual use, in view of the fact that the absorbent sheet containing the powdery polymer is placed in a position to cover the upper surface of said lower other absorbent layer,

though the absorbent sheet containing the powdery polymer is provided with the body exudates guide holes. Such function of the absorbent powdery polymer to prevent the body exudates from flowing inversely to ooze through the surface of the article, will be reinforced in proportion to the degree of swelling of the absorbent powdery polymer through the absorption of the body exudates; the body exudates guide holes will gradually be reduced in size with the development of the swelling of the absorbent powdery polymer and be finally closed, in which case the function of the absorbent powdery polymer to prevent inverse flowing of the body exudates will best be observed.

How the foregoing objects and advantages are attained will appear more fully from the following description referring to the accompanying drawings, in which:

Figure 1 is a partially enlarged plan view of an absorbent sheet with particular construction to be employed as one element to constitute a body exudates absorbent material according to the present invention;

Figure 2 is an enlarged sectional view taken along the line 2-2 of Fig. 1;

Figure 3 is an exterior perspective view of a sanitary napkin, showing one embodiment of the body exudates absorption article according to the present invention;

Figure 4 is an enlarged sectional view taken along the line 4-4 of Fig. 3; and

Figure 5 is an enlarged sectional view corresponding to Fig. 4 showing another embodiment of the article according to the present invention.

Referring now to Figs. 1 to 5, designated generally by reference numeral 11 is an absorbent sheet of particular construction. As is shown in Figs. 1 and 2, the sheet 11 comprises the construction wherein absorbent powdery polymer 13 is distributed with substantial uniformity throughout the space provided between a water permeable thin sheets 12a and 12b i.e. the absorbent powdery polymer 13 is sandwiched between the water permeable thin sheets 12a and 12b. In addition to such unique construction, the entire surface of the absorbent sheet 11 is embossed to form a number of upper surface dent portions 14 each having a body exudates guide hole 15 and a section of such dent portions represents a hopper-like configuration. The body exudates guide holes 15 are provided in the ratio of 10 to 40 %, preferably 20 to 30% with respect to the surface area of the absorbent sheet 11.

The absorbent polymer employed in the present invention may be a polymer which is of substantial water-insoluble character under the ambient temperatures at the time of actual application of the article; is capable of absorbing the body exudates such as menstrual discharge, urine or the like, in amounts of 50

or more times its own weight; is swellable to gel on absorption of the body exudates; and is capable of holding the absorbed body exudates to prevent oozing event when pressure is applied thereon. Such polymer may, for example, be at least one kind of polymer to be selected from a crosslinked graft copolymer formed from a monomer or polymer or copolymer using monomers such as acrylonitrile, acrylamide, acrylic acid, acrylic ester, methacrylonitrile, methacrylonitrilic acid ester, or vinyl acetate or polymers or copolymers thereof; or from a crosslinked graft copolymer formed from a combination of said monomer with starch, or of said polymer with starch, or of said copolymer with starch; or from carboxymethyl cellulose or polyvinyl alcohol or the like, crosslinked by the use of epichlorohydrin isocyanate, acrylic acid, formaldehyde, glyoxal or the like. All of these absorbent polymers and well known as absorbent materials for the body exudates absorbing articles or the like and, thus, no great importance is placed on the use of these polymers themselves in the present invention. Thus it is possible to employ other polymers than the aforementioned polymers, provided that such other polymers have the characteristic feature explained above. The quantity of the absorbent powdery polymer 13 to be used is limited to the range of from 10 to 45g./m<sup>2</sup>, which range will be preferable to attain one of the objects of the present invention sufficiently to prevent the body exudates from flowing inversely to ooze. In the case where the quantity of the absorbent powdery polymer is less than 10g./m<sup>2</sup>, there will be the risk of the body exudates absorbed by the absorbent layer 20 to be explained hereinafter being caused to flow inversely to ooze whilst in the case where the quantity of the absorbent powdery polymer is more than 45g./m<sup>2</sup>, there will be the risk of the body exudates absorbed being prevented from flowing smoothly downward through the powdery polymer whereby the body exudates will be caused to ooze through the absorbent sheet 11. The aforementioned range of quantity of such powdery polymer will also be preferable in order to maintain the body exudates permeable thin sheets 12a, 12b in a sufficient sandwiched state with respect to each other. As a material for the body exudates permeable thin sheets 12a, 12b, any one of the hydrophilic fibers, hydrophobic fibers such as wood pulp, rayon, acryl, polypropylene or the like may be used, provided that they be body exudates permeable. It will, however, be preferable to arrange that, at least the sheet 12a disposed in the upper portion of the sheet 11 consists of a tissue paper made mainly from wood pulp, such that the body exudates may diffusely be absorbed by the sheet 12a and the absorbent powdery polymer 13 disposed thereunder may be utilized

over a wide range. It will further be advisable to see that, as a material for the body exudates permeable thin sheets 12a, 12b, a material containing the fibers in quantity of from 10 to 30g./m<sup>2</sup> be used so that such thin sheets 12a, 12b may be of intensity sufficient to support therebetween the the absorbent powder polymer 13; to obviate the risk of the same thin sheets being torn while being worn by the user and the powdery polymer 13 being forced out therefrom; and so that the body exudates after discharging may immediately be absorbed by the powdery powder 13 without being absorbed too much by the upper thin sheet 12a.

A method of manufacturing the sheet 11 of the type explained above will typically be as follows:

The sheet 12b will be transferred horizontally from one side to the other side; the absorbent powdery polymer 13 will then be distributed thereon with substantial uniformity from an upward direction; a fixing agent such as water, and water-soluble and/or water swellable resin or the like will be sprayed simultaneously with the distribution of the powdery polymer 13 or after such distribution has been finished according to necessity; whereafter, the sheet 12a will be transferred in the same direction as the sheet 12b so as to be above the powdery polymer 13; while the sheet 12a is being transferred both of these sheets 12a, 12b with the powdery polymer 13 therebetween will be conveyed toward a pair of embossing rolls, each having a number of rugged patterns in its circumference, to be put therebetween and to be embossed; in this instance, the center portions in the dents of one embossing roll will be caused to collide strongly with the apex portions of the convexed portion on the other embossing roll so that the sheets 12a, 12b may partially be broken through whereby the body exudates guide holes 15 are provided. Accordingly, the sheets 12a, 12b surrounding each of the body exudates guide hole 15 extend generally in a downward direction with their lower ends being sealed, as shown in Fig. 2. The sheet 11 has a fretwork pressed portion 16, as illustrated in Figs. 1 and 2, due to strong pressure applied by the dent portions and the convexed portions of said pair of embossing rolls.

Such sheet 11 manufactured in a way as above explained will, for example, be used for body exudates absorbing articles 17, 18 as shown in Figs. 4 and 5. More specifically, the article 17 shown in Fig. 4 has a construction wherein, on the upper surface of a body exudates impermeable waterproofing sheet 19, an absorbent layer 20 which consists only of a crepe tissue paper or of a crushed pulp or of combination of these materials is disposed; one or more of the sheets 11 (the body exudates guide holes 15 are omitted in this

drawing) is/are piled on the upper surface of the absorbent layer 20; both of the long side portions of the sheet 19 are arranged to appear on the upper surface of both of the long side portions of the piled member to lie upon one another; the whole of such members are covered by a body exudates permeable facing sheet 22 having in its interior surface a low density thin fibrous web 21; and both of the short side portions 23 of the sheets 19, 22 are joined through a hot pressing or hot melting method or the like (see Fig. 3). The body exudates absorbing article 18 as shown in Fig. 5 is of same construction as the aforementioned article 17 except for an alternative arrangement where one or more of the sheets 11 (body exudates guide hole 15 being omitted) is/are disposed on the upper portion of the absorbent layer 20 as well as on the upper portion of a further absorbent layer 20 adjacent to the first absorbent layer 20.

As a material for the fibrous web 21, hydrophilic or hydrophobic fibers such as cotton, rayon, polyester, acryl or the like can solely or jointly be used. The thickness of fibrous volume of the web 21 may be of a degree by which the body exudates discharged may immediately be allowed to pass in the direction of the thickness of such web 21 and then be absorbed by the sheet 11 and, in the event of the body exudates oozing through the upper surface of the sheet 11 before passing through the body exudates guide holes 15, such body exudates may immediately be prevented oozing further through the sheet 22. As a material for the sheet 22, similar fibrous materials such as those which were referred to above for use with the web 21 can be used. In order to allow the body exudates discharged to be absorbed by the sheet 22 and then to pass through such sheet 22 without diffusion, also in order to obviate the risk of the body exudates absorbed by the web 21 flowing inversely toward the sheet 22 due to capillarity, it will be preferable to see that the fiber for the web 21 as well as the sheet 22 be more than 70% by weight hydrophobic and also the fibrous volume for the sheet 22 be in the range of from 10 to 30g./m<sup>2</sup>, 0.01 to 0.4g./m<sup>3</sup>.

The sheet 22 with such web 21 as discussed above may be obtained through, for instance, causing the web 21 to be adhered to the interior surface of the sheet 22 by the utilization of the adherent nature of the fiber of the web 21, or through causing the web 21 to be adhered to the interior surface of the sheet 22 by means of a binder. As such a binder, either a hydrophilic or a hydrophobic binder can be used. It will, however, be advisable to use a hydrophobic binder of more than 70% by weight, in order to obviate the possibility of the body exudates remaining in the sheet 22.

As the sheet 19, a waterproofing paper which is a tissue treated with a sizing agent or a plastic film may individually or jointly be used. In order to prevent sufficiently the oozing of the body exudates, however, it will be advisable to use a waterproofing paper the interior surface of which is laminated with a plastic film.

In the actual application of the articles 17, 18 shown in Figs. 4 and 5, the body exudates discharged from body of the user will pass through the upper sheet 22, the web 21 and reach the sheet 11. The body exudates reaching the sheet 11 will then flow into some of the dent portions 14 formed in the upper surface of the sheet 11, pass through the sheet 12a within the dent portion 14 and finally be in contact with the powdery polymer 13 to be absorbed thereby, overflowing body exudates not having been absorbed at one time moving into the lower absorbent layer 20 via the guide hole 15.

Since the sheet 11 containing the powdery polymer 13 is arranged to be in a preferable position to contact fully the initial discharge of the body exudates, a substantial volume of the body exudates discharged will effectively be absorbed by the sheet 11.

The body exudates so absorbed by the powdery polymer will not be forced to ooze even if pressure is applied during the actual use of the article 17, 18, this being due to excellent absorption and holding ability of the powdery polymer 13 as previously discussed. The body exudates absorbed by the absorbent layer 20 will be caused to flow inversely upwardly by the pressure applied during the use; oozing of such inverse flow of the body exudates through the facing sheet, however, can be kept to a minimum, this being due to the arrangement where the powdery polymer 13 in the sheet 11 represents generally a layer and is placed in a position above the absorbent layer 20 to be able to act as a barrier to prevent the inverse flow of the body exudates, even though the guide holes 15 to provide openings are formed. In order to prevent the inverse flow and oozing of the body exudates from the articles 17, 18, more sufficiently from the initial stage when the articles are about to be used, it might be preferable to form the guide holes 15 only after correct and careful calculation has been made with respect to the number as well as the size of the holes to be provided. Since, however, the size of the guide holes 15 becomes gradually smaller as the swelling of the powdery polymer 13 advances on absorption of the body exudates and such guide holes will ultimately be closed, and since such changment in the size of the guide holes depends greatly on the time of use of the articles 17, 18 as well as the volume of the body exudates to be discharged, no correct calculation could easily be made. Provided,

however, that the guide holes 15 are provided within a range of preferably from 20 to 30% with respect to the surface area of the sheet 11 and that the use of the powdery polymer 13 is within a range of from 10 to 45g./m<sup>2</sup>, it will be possible to prevent the inverse flow and oozing of the body exudates from the initial time of the application of the article, to an almost satisfactory degree. In the case where the guide holes 15 become small and are about to be closed, or in the case where the sheet 11 is provided in the upper portion of the absorbent layer 20 and adjacent to such upper portion, prevention of the inverse flow or oozing of the exudates may more effectively be carried out to a more satisfactory degree. In the case where the guide holes 15 are closed completely, complete prevention of the inverse flow or oozing of the body exudates can be effected whilst, on the other hand, smooth travelling of the body exudates toward the absorbent layer 20 will be affected. The articles 17, 18 will normally be replaced with a new one at least before the guide holes are completely closed; from which it follows that no actual inconvenience as referred to above will be observed.

In the present invention, the sheet 11 is provided with dent and convexed portions 14 and the web 21 is provided between the sheets 11 and 22, from which it follows that a preferable interval exists between the sheet 22 and the sheet 11 whereby even in the case where a large volume of the body exudates is discharged at one time and absorbed by the sheet 11, and even in the case where the body exudates remain in the dent portion 14 in the upper surface of the sheet 11, there will be no large risk of the remaining body exudates contacting the sheet 22 to ooze through the surface thereof.

It is to be noted that the words "upper portion or upper layer" used in connection with the absorbent layer and the sheet 11 in the specification shall be understood to indicate not only the uppermost surface of the absorbent layer 20 but also indicate the case where the sheet 11 is disposed adjacent to such uppermost surface of the absorbent layer 20. This is because of the fact that it will be possible to attain substantially the object of the present invention, even if one to two sheets of hydrophilic sheet of less than 20g./m<sup>2</sup> or one to two sheets of water permeable sheet of less than 30g./m<sup>2</sup>, made mainly from hydrophilic fiber, are put on the upper surface of the sheet 11.

While there have been described what are at present to be the preferred embodiments of the present invention, it will be understood that various modifications may be made therein.

#### CLAIMS

1. A body exudates absorbing article hav-

ing a body exudates absorbent layer comprising individually or jointly a tissue paper, a crushed pulp or the like absorbent layer disposed on the upper surface of a body exudates impermeable waterproofing sheet, the whole of these elements being covered with a body exudates permeable surface sheet and at least both of the short side portions of said surface sheet being joined by means of a method of hot pressing or of hot melting or the like joining method; wherein at least one sheet of an absorbent sheet containing a powdery polymer is disposed on the upper portion of said absorbent layer, and said powdery polymer, which is substantially water-insoluble under ambient temperatures, is capable of absorbing body exudates of a weight of more than ten times its own weight, is swellable upon absorption of body exudates up to gelation and is capable of holding the body exudates discharged even under pressure to prevent oozing of the body exudates, is sandwiched between at least two sheets of body exudates permeable thin sheets; and an entire surface of said body exudates permeable sheets with said powdery polymer therebetween is embossed to provide a number of embossments, a body exudates guide hole being provided in the center of an embossment portion formed through said embossment treatment.

2. A body exudates absorbing article as claimed in claim 1, wherein a body exudates guide hole in the absorbent sheet is provided in a range of from 10 to 40% with respect to the surface area of said sheet and wherein an absorbent powdery polymer disposed in said sheet is used in a range of from 10 to 45g./m<sup>2</sup>.

3. A body exudates absorbing article as claimed in claim 1 of claim 2, wherein the surface sheet has a thin fibrous web at its inner surface, and said sheet as well as said web are made mainly from hydrophobic fiber or made only of such fiber.

4. A body exudates absorbing article as claimed in claim 1 and substantially as hereinbefore described with reference to and as illustrated in Figs. 1 to 4 of the accompanying drawings.

5. A body exudate as claimed in claim 4, modified substantially as hereinbefore described with reference to and as illustrated in Fig. 5 of the accompanying drawings.

Printed for Her Majesty's Stationery Office  
by Burgess & Son (Abingdon) Ltd.—1979.  
Published at The Patent Office, 25 Southampton Buildings,  
London, WC2A 1AY, from which copies may be obtained.